

ART. III.—*Floral Abnormalities in the Genera Eriostemon
and Glossodia.*

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(With Plate III. and 4 Text Figure.)

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1. *Eriostemon*.

Specimens of flowers of *Eriostemon obcordalis*, Cunn., were found in the early spring of 1919, which even on superficial examination had deviated from the normal form. These at first were found on one bush only, but on that bush every opened flower was abnormal. When the same abnormality was also observed on three other plants, all in close proximity to the one first found, I decided to collect material, an examination of which has led to the following result:—

Occurrence and Nature of Abnormality.

The plants occur in the Castlemaine district, in the hills which lie between the townships of Chewton and Fryerstown. *E. obcordalis* grows well, and very abundantly in this area. Four abnormal plants in all were found. Two of these, about twelve feet apart, are large bushes, evidently a few years old, whilst the remaining two are smaller, and probably younger. Each of the latter is one foot from one another, and about two feet from one of the larger plants.

The fact that quickly drew my attention to these bushes was the unusual appearance of their flowers. These were slightly smaller than the normal, with petals more or less erect, in contrast to the expanded petals of the normal flower. The reason for this was not hard to find, for even without the aid of a lens, a small outgrowth containing pollen was seen to be present on the ventral surface of almost every petal. In most cases the five petals were all antheroid, but in others, one, two, or more were found to be without this structure. After the examination of a great number of buds and opened flowers, three only were found to have all their petals completely devoid of anther structure.

The normal flower of *E. obovalis* has five somewhat strap-shaped petals, which are always fully expanded, exposing the two whorls of stamens to view. (Plate III., Fig. 3.)

The typical abnormal flower also has five petals, similar in colour to the normal; these, however, never become fully expanded, but remain more or less erect, partially blotting the stamens from view. Each petal has a distinctly waved outline, and the tip of the lamina is generally incurved, forming a little hood, as it were, around the anther, which is situated a little above the middle line, on its ventral surface. No other change is noticeable, the sepals, stamens, and carpels being the number characteristic of the genus. (Plate III., Fig. 2.)

An extreme type of abnormal flower, and one of far less frequent occurrence is figured on Plate III., Fig. 4. In this case the lamina of each petal is modified to form a narrow filament-like structure, with a small expanded distal portion on which the anther is placed. It has been found, as is shown in Text figure 1, that the degree of reduction of the petal is dependent upon the simplicity or complexity of the anther it bears. The complex anthers here present will therefore account for the extreme modification of the petals, to such an extent that the latter are hardly distinguishable from true stamens. This resemblance is further emphasised by the presence of short hairs on the filamentous portion of lamina, similar to those present on the staminal filaments.

Structure of the Anther.

For the examination of the structure of the petal and anther, microtome sections were used, all of which were stained with Delafield's Haematoxylin. Petals from unopened buds have been used both for this purpose, and for the examination of the form of the anther and its relation to petal. This was done principally to facilitate obtaining complete drawings with the camera lucida, under a low power of the microscope, but also because of the greater abundance of buds than opened flowers in the material.

The anther is very variable in form and structure—as all gradations are met with, from the simple unilocular to the complex quadrilocular condition. These stages are shown in Text figure 1, and may be summarised as follows:—

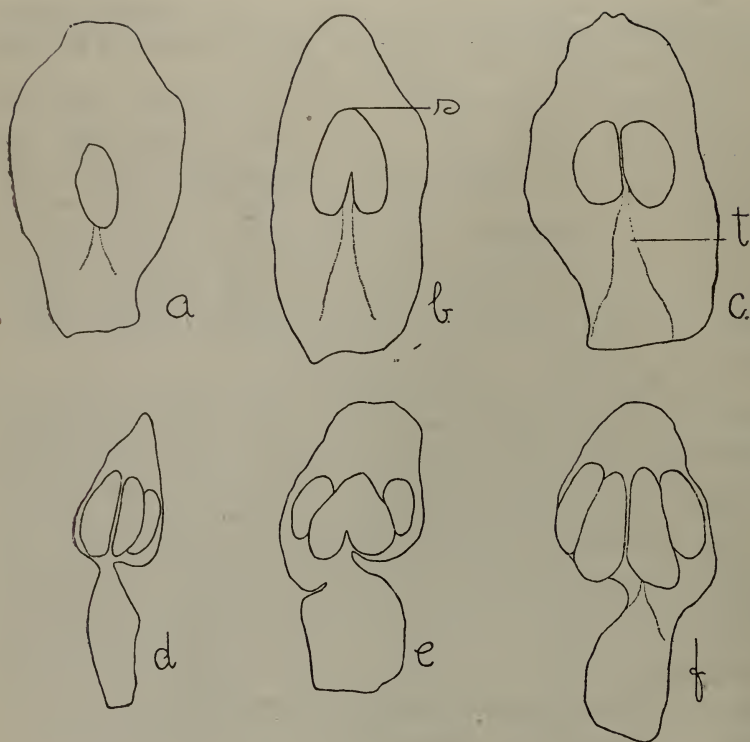


FIG. 1.—STAGES IN THE COMPLEXITY ANTHER FORMATION.

- a. Shows the simplest stage of anther formation in which a single loculus is present.
- b. Translation stage from unilocular to bilocular condition.
- c. Bilocular anther.
- d. Trilocular anther.
- e. Transition stage from trilocular to quadrilocular condition.
- s. Point at which dehiscence takes place.
- t. Cells rich in tannin.

In Plate III., Fig. 5, is figured a vertical section of a young antheriferous petal, the anther of which contains four loculi. Here the lamina is feebly developed, so that the whole structure, petal and anther, strongly resembles the appearance of a similar section of a normal anther. Pollen grains and a tapetal layer are present in each pollen sac.

In Text figure 2, the section represented is one of a more mature petal. The tapetal cells have disappeared, whilst the mechanical elements of the anther are strongly developed. The



FIG. 2.

TRANSVERSE SECTION OF PETAL BEARING UNILOCULAR ANTHER.

l. Lamina.

t. Thick walled tannin-containing cells.

anther is unilocular, and its fibrous layer is clearly seen. The cells in the region between the vascular bundle of the lamina and the anther have their walls considerably thickened. In fact, just before dehiscence the great majority of the cells of the petal have the annular and reticulate thickenings so characteristic of the mechanical tissues of anthers. Above and on either side of the vascular strands are large thick-walled cells, which contain tannin, and the cells of the upper epidermis also have thick walls.

In the drawings of both sections the cell contents, such as Tannin and Hesperidin, so freely present, have been omitted.

Dehiscence in the simple forms of anther takes place by means of a split, which develops at the distal end of the anther in such a way that a space is formed between the wall of the anther and the under epidermis of the petal. In this way the pollen, which is abundantly developed, and apparently quite normal, may be seen escaping. In the more complex forms of anther a longitudinal dehiscence takes place.

Discussion.

The only reference to any teratological abnormality in the genus *Eriostemon*, given by Penzig, in his "Pflanzen Teratologie," is one to a record by Dr. Masters¹, of the occurrence of double flowers in *E. obovalis*. He writes as follows: "Both specimens are remarkable as illustrating the occurrence of double flowers in Australia. . . . The supposed infrequency in such plants is due probably to imperfect observation rather than to absolute deficiency." This variation in the number of parts is indeed quite

¹ Gard. Chron., 1877, pt. 2, p. 726.

commonly met with, there being either an increase or decrease in the number. The parts of the corolla are the members most usually affected, but one specimen noted had the floral formula— $K_6C_6A_6+6G_6$.

Several examples of "Staminody of the Corolla" are given by Masters² and Worsdell³. As far as can be ascertained, however, the occurrence of partial staminody of the corolla in the genus *Eriostemon*, has not been previously noted; this short account has therefore been deemed justifiable.

The fact that more than one individual illustrated this occurrence, and that two are obviously younger, and so probably the offspring of one of the larger ones, led me to think that this phenomenon might recur from year to year. Such has proved to be the case, for an examination of this year's buds has, in every instance, shown the presence of the abnormality above described. It therefore seems quite possible that these characters are those of a variety of *E. obovalis*, which has developed from the type as a mutant, but this fact can only be definitely determined by further observation and experiment.

2. Glossodia.

In the spring of 1919 two anomalous specimens of *Glossodia major*, R. Br., were found, both of which were characterised by the possession of two labella, as well as an abnormal arrangement of the perianth segments. Mr. E. E. Pescott tell me that the occurrence of two or more labella in the genus *Glossodia*, and the allied genus *Caladenia*, is of no very uncommon occurrence, a few specimens being obtained each year; but, as far as can be ascertained, very little attention seems to have been given to these forms.

Specimen A.—(Text fig. 3) the perianth segments are six in number, the three outer calyx lobes being very similar to the two lateral corolla lobes, in size, shape and colour. The median anterior petal is in the form of a labellum, or "lip," which is bulged and dilated, with the distal region purplish, tapering to a point. The labellum bears a blunt, yellow appendage.

Specimen B (Text fig. 3) was collected by Miss S. Altman at Beaconsfield. It varies from the normal, firstly in the development of a median flat petal (p. 3), quite indistinguishable from the two paired petals, and secondly in the development of two quite perfect labella, one on either side of the antero-posterior

² Vegetable Teratology, 1868, p. 298.

³ Principles of Plant Teratology, 1916, vol. ii., pp. 153-156.

plane. Each labellum is quite similar in shape and colour marking to that of the normal flower. Apparently the anterior corolla lobe, instead of being developed in the form of a "lip," has become flat and petal-like, the two labella present being developed alternately with this structure, and hence the position of the two lateral stamens of the outer whorl. There is no evidence save their position to suggest that they are due to the modification of these two missing stamens.

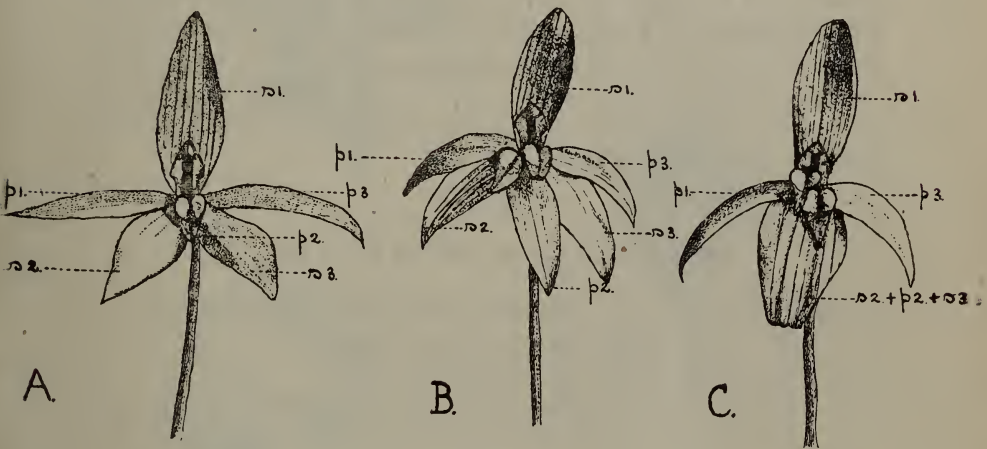


FIG. 3.

A. Normal, B. and C. abnormal flowers of *Glossodia major*.
s. sepaloid, p. petaloid segments of perianth.

Specimen C (Text fig. 3) was found by the writer at Chewton, and, fundamentally, the abnormality is similar to the one above described. In the anterior region of the flower, a flat petaloid expansion is situated, the apex of which is divided into three notches. At its proximal end, and in the median line, it bears



FIG. 4.—ANTERIOR COMPOUND LOBE OF SPECIMEN C. ENLARGED.

s. sepaloid, p. petaloid components.
a. appendage.

a small cylindrical outgrowth, which is fused with the petal-like structure for about half its length, the remaining portion being free. Two perfect labella are present, alternating with the median portion of the compound perianth segment.

The interpretation is that the median lip is here replaced by a flat petal, which has become fused with the two lateral sepals to form a single anterior compound lobe $S_2+S_3+P_3$. The evidence for this conversion of the lip to a flat petal, is firstly the presence of three notches at the apex of the compound segment, the median one of which suggests the anterior petal, and secondly the presence of a rudimentary appendage, attached to the middle region. If this view is taken, the two labella which alternate with the median segment are in the position of the two lateral stamens of the outer whorl.

EXPLANATION OF PLATE III.

- Fig. 1.—Shoot of *E. obovalis*, showing abnormal flowers.
.. 2.—An abnormal flower, slightly enlarged.
.. 3.—A normal flower, enlarged x 5.
.. 4.—An extreme type of abnormal flower, in which the petals are almost reduced to the condition of stamens. x 5.
.. 5.—Transverse section of petal bearing a quadrilocular anther. Pollen grains and tapetal cells are shown.
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